

WHAT IS CLAIMED IS:

1. An apparatus for containing fuel comprising:

a housing;

5 a first compartment disposed within the housing for holding a solid fuel, the first compartment having an inlet port, and at least one outlet port;

a second compartment disposed within the housing for holding a liquid that reacts with the solid fuel and having at least one outlet port;

10 a conduit providing fluid flow between the first compartment inlet port and the second compartment outlet port; and

means for restricting the fluid flow between the first compartment inlet port and second compartment outlet port.

2. The apparatus of claim 1 wherein the fuel comprises a metal hydride.

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3. The apparatus of claim 2 wherein the fuel comprises a metal hydride selected from the group consisting of lithium hydride, sodium hydride, potassium hydride, beryllium hydride, magnesium hydride, calcium hydride, and mixtures thereof.

20 4. The apparatus of claim 1 wherein the liquid is selected from the group consisting of water, dilute solutions of acids, and dilute solutions of bases.

5. The apparatus of claim 1 further comprising a hydrophobic membrane covering at least a portion of the outlet ports of the first compartment, wherein the membrane is permeable to hydrogen gas.

5 6. The apparatus of claim 1 wherein the means for restricting the fluid communication between the first compartment inlet port and second compartment outlet port is a valve.

7. The apparatus of claim 6 further comprising an activation means for opening and closing the valve.

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8. The apparatus of claim 7 further comprising a means for controlling the activation means.

9. The apparatus of claim 8 wherein the controlling means is an electronic switch.

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10. The apparatus of claim 1 wherein the second compartment is under pressure.

11. The apparatus of claim 1 further comprising a bladder disposed within the second compartment for containing a gas under pressure.

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12. The apparatus of claim 5 further comprising a flexible elastomeric material disposed on an external face of the housing and in a surrounding relationship to the portion of the first compartment covered with the hydrophobic membrane.

13. A solid fuel cartridge for use in a fuel cell comprising;

a plurality of solid fuel containers, wherein each container comprises:

a housing having at least one opening;

a cover covering the opening in a sealing manner;

5 means for selectively unsealing the cover from the housing; and

means for switching between the unsealing means for one container to the unsealing means for another container.

14. The cartridge of claim 13 wherein the means for selectively unsealing the cover
10 comprises an electrical heating element.

15. The cartridge of claim 13 wherein the plurality of solid fuel containers are in a rectangular grid array or a spiral wound array.

15 16. The cartridge of claim 13 wherein the cover is made of a bi-metallic material that springs open upon heating.

17. The cartridge of claim 13 further comprising:

20 a cover for each solid fuel container, where each cover comprises a flexible material; and

an adhesive for sealing the cover over the opening, wherein the adhesive when heated loses its adhesive power.

18. The cartridge of claim 13 wherein the cover is a low melting point wax or thermoplastic.

19. The cartridge of claim 18 wherein the low melting point wax or thermoplastic melts
5 at a temperature between about 100°C and about 200°C.

20. The cartridge of claim 13 wherein the means for selectively unsealing the cover is an electrical resistor for generating heat to melt the cover.

10 21. The cartridge of claim 13 wherein the switching means is an electronic switch.

22. The cartridge of claim 13 further comprising an adsorbent compartment and containing a material for adsorbing carbon dioxide.

15 23. An apparatus for holding a fuel cartridge for a fuel cell, comprising:

a housing having a cartridge port for inserting the fuel cartridge and at least one discharge port for the discharge of gas to the fuel cell;

a fuel cartridge tray for holding the fuel cartridge within the housing and slideably affixed to the housing to move between an open position and a closed position through
20 the cartridge port; and

means for communicating with the fuel cartridge.

24. The apparatus of claim 23 further comprising a motor for moving the fuel cartridge tray between the open position for receiving the fuel cartridge and the closed position.

25. The apparatus of claim 23 further comprising spring attachments having a first end affixed to the housing and a second end affixed to the cartridge tray.

5 26. The apparatus of claim 23 further comprising a door, wherein the door is positioned to cover the cartridge port when the fuel cartridge tray is in the closed position.

27. The apparatus of claim 26 further comprising at least one spring having a first end affixed to the housing and a second end affixed to the door.

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28. The apparatus of claim 26 further comprising a latch for maintaining the door in a closed position.

15 29. The apparatus of claim 26 further comprising an elastomeric material affixed to the door in a surrounding relationship to provide a sealed condition when the fuel cartridge tray is in the closed position.

30. The apparatus of claim 26 wherein the door is affixed to the fuel cartridge tray.

20 31. The apparatus of claim 23 further comprising;

means for pressing the fuel cartridge against the discharge port.

32. The apparatus of claim 23 wherein the means for communicating with the fuel cartridge is an electronic contact.

33. A fuel cell system comprising:

a housing having a cartridge tray port, and said housing defining a space for a fuel cartridge;

5 a fuel cartridge tray for holding the fuel cartridge having a rigid open framework, slideably attached to the housing and moveable through the cartridge tray port between an open position and a closed position; and

at least one MEA disposed within the housing, wherein the MEA has an anode side and a cathode side and the anode side of the MEA is facing the space for the fuel
10 cartridge tray.

34. The fuel cell system of claim 33 further comprising a door affixed to the fuel cartridge tray or to the housing and positioned to cover the cartridge tray port when the fuel cartridge tray is in the closed position.

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35. The fuel cell system of claim 33 wherein the housing has a substantially rectangular prismatic structure and further comprising 2 MEAs, disposed within the housing on opposing sides of the fuel cartridge tray, with each MEA anode side facing the fuel cartridge tray.

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